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| APPLICATION NO.  | FILING DATE   | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|---------------|----------------------|---------------------|------------------|
| 10/524,229   | 02/09/2005    | Masayoshi Kitada     | 13425.0064USWO      | 1558             |
| 52835  | 7590          | 02/06/2008           | EXAMINER            |                  |
| HAMRE, SCHUMANN, MUELLER & LARSON, P.C.<br>P.O. BOX 2902<br>MINNEAPOLIS, MN 55402-0902 |               |                      | MENDEZ, ZULMARIA M  |                  |
| ART UNIT   | PAPER NUMBER  | 1795                 |                     |                  |
| MAIL DATE  | DELIVERY MODE | 02/06/2008           | PAPER               |                  |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

|                              |                              |                     |  |
|------------------------------|------------------------------|---------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b>       | <b>Applicant(s)</b> |  |
|                              | 10/524,229                   | KITADA ET AL.       |  |
|                              | Examiner<br>ZULMARIAM MENDEZ | Art Unit<br>1795    |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 25 October 2007.

2a) This action is FINAL.      2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 5-11 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) Claim(s) \_\_\_\_\_ is/are allowed.

6) Claim(s) 5-11 is/are rejected.

7) Claim(s) \_\_\_\_\_ is/are objected to.

8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All    b) Some \* c) None of:

1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

|  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date: _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date: _____   | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 6 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. On page 10, line 26, the applicant states that a negative voltage of 1,500V is applied between the electrodes. Thus, the range between 1,000-1,500 volts is not supported by the specification.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 5 and 7-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chambers (US Patent no. 6,126,794) in view of Switzer (US Patent no. 4,663,004).

With regard to claim 5, Chambers discloses an apparatus for the production of hydrogen consisting of electrodes (205a-d of figure 2) connected to power supply terminals (108a, 108b) so that they can receive a pulsed electrical signal from a power supply (col.4, lines 29-33); a container holding water and at least one pair of closely spaced electrodes arranged within the container and submerged in the water (col. 2, lines 31-35). However, Chambers fails to disclose electrodes comprising a semiconductor or a semiconductor compound and wherein the apparatus has two stages: the first stage has a first electrode connected to the positive terminal and the second electrode is connected to the negative terminal wherein application of the pulse electric power between the fast electrode and the second electrode activates hydrogen atoms contained in the water or the liquid to produce hydrogen gas, and a second state where the polarity of the electrodes has been reversed and also produces hydrogen gas. Even though Chambers doesn't explicitly disclose reversing the polarity of the electrodes to produce hydrogen in each of the stages, it is well known in the art to configure the electrodes in such a way that they are exchangeable connected to the positive and negative terminals of the power supply in order to accomplish the desired chemical reaction within the electrolytic cell. Further, a polarity reversing power supply would meet this feature since it would provide two states each of which produces

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hydrogen gas. The manner of operating a device does not differentiate an apparatus claim from the prior art. A recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus if the prior art apparatus teaches all the structure limitations of the claim. See MPEP 2114.

Switzer discloses an electrochemical cell well suited for converting water into hydrogen and oxygen (col. 3, lines 6-8) wherein the electrodes are made of a semiconductor material and are immersed in a liquid containing an electrolyte (col. 2, lines 63-68; col. 3, lines 9-15) in order to increase the applications of the electrochemical cell of the conventional type due to the electrodes' lower cost, dimensional stability, higher chemical activity and effective generation of current densities among others. Therefore, one having ordinary skill in the art would have been motivated to use semiconductor electrodes, as taught by Switzer, in the electrochemical apparatus of Chamber in order to increase the applications of the electrochemical cell of the conventional type due to the electrodes' lower cost, dimensional stability, higher chemical activity and effective generation of current densities among others.

With regard to claim 7, apparatus disclosed by Chambers further comprises a heating device (col. 3, lines 64-67).

With regard to claims 8 and 9, the semiconductor forming the electrodes, as disclosed by Switzer, comprises at least one element selected from a group consisting of silicon, germanium, gallium, phosphorus, arsenic, cadmium, sulfur, and selenium.

With regard to claims 10 and 11, Chambers further discloses wherein the

electrodes can be almost any shape such as flat plates, rods, tubes or coaxial cylinders (col. 4, lines 26-28).

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chambers and Switzer as applied to claim 5 above, and further in view of Wang et al. (US Patent no. 6,800,386).

With regard to claim 6, Chambers in view of Switzer comprises all of the structure as disclosed above in claim 5, but fails to teach wherein the pulse electric power has a voltage of higher than or equal to 1000 volts (V) and a current of less than or equal to 5 milliamperes (mA). However, Wang discloses a process for preparing hydrogen in a fuel processor assembly comprised of a means for supplying a high voltage electrical discharge (col. 1, lines 48-51) in the form of a pulse (col. 5, lines 43-44). In one embodiment, the electrical discharge is at a voltage in excess of 10,000 volts and a current of 5 mA (col. 5, lines 41-42 and 47). It is well known in the art that increasing the power distribution throughout the cell, the hydrogen generation will also be increased. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to optimize the voltage and current values of the power supply, as disclosed by Wang, in the electrochemical apparatus of Chambers in view of Switzer in order to increase the generation of hydrogen gas.

***Response to Arguments***

7. The new grounds of rejection made in this Office Action were necessitated by the amendment. The arguments presented are addressed below.
8. Applicant's arguments, see page 5, filed on October 25, 2007, with respect to the rejection of claim 1 under 35 U.S.C 103(a) as being unpatentable over Chambers in view of Bockris have been fully considered and are persuasive. The applicant argues that combining the abovementioned references would render Chambers inoperable since if Bockris were to reverse the polarity of the applied current, it would be fighting to overcome the natural charge generated by the photo-electrodes. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made above.
9. Applicant's arguments with respect to claim 4 have been considered but are moot in view of the new ground of rejection. The applicant argues that the second step of Weinberg compresses hydrogen produced in the first step instead of generating hydrogen gas. Therefore, the Weinberg reference has been withdrawn from further consideration.

***Conclusion***

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

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§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ZULMARIAM MENDEZ whose telephone number is (571)272-9805. The examiner can normally be reached on Monday-Thursday, 8:30am-5:00pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ZM 361

  
ALEXA D. NECKEL  
SUPERVISORY PATENT EXAMINER